Good afternoon: warm up in notebooks

Below is an alternate definition of continuity (write it down)

$$\boxed{f(x) \text{ is continuous at } x=c \quad \text{if } \lim_{x\to c-} f(x) = f(c) = \lim_{x\to c+} f(x)}$$

1. Explain each part in words, using the analogy of roads and bridges.
2. Use this definition to determine if the following is continuous everywhere:

$$f(x) = \begin{cases} x^2 - 4x & x \neq 3 \\ 5 & x = 3 \end{cases}$$

ans

1. left road meets bridge meets right road
2. both pieces are continuous everywhere else...are they cont. at x=3??

lim from left: 3^2-4(3) = -3

f(3) = 5

lim from right: 3^2-4(3) = -3

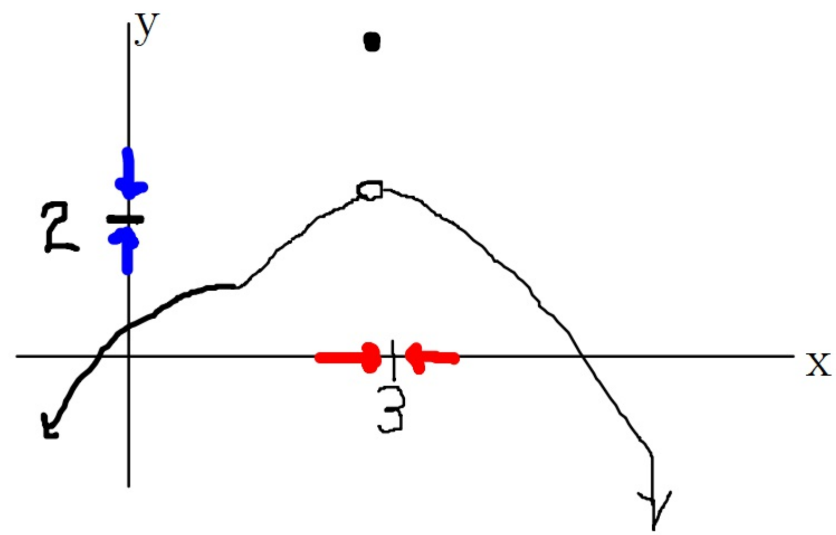
$-3 \neq 5 \neq -3$

NO

Remov. disc.

What <u>is</u> a limit?

as you approach 3,
what is the y value?
2



x	f(x)
2.9	1.9
2.99	1.99
⋮	⋮
3	
3.001	2.001
3.1	2.1

$$\lim_{x \to 3} f(x) = 2$$

Absolute Value Limits

$$\lim_{x \to 1} \frac{|x-1|}{x-1}$$

where is $x-1>0$?

$x>1$

piecewise

$$f(x)=\frac{|x-1|}{x-1}$$

abs. val. is irrelevant.

multiply argument by -1

$$f(x)=\begin{cases} \left[\cancel{\dfrac{x-1}{x-1}}\right] & x>1 \\ -\cancel{\dfrac{(x-1)}{x-1}} & x<1 \end{cases}$$

$$f(x)=\begin{cases} 1 & x>1 \\ -1 & x<1 \end{cases}$$

$\lim_{x \to 1} f(x)$ dne

Absolute values are actually piecewise functions

1. Find where argument >0
2. Rewrite function as piecewise
3. Take limit from both sides

[redacted]

$$\lim_{x \to 5} \frac{|x-5|}{x^2+3}$$

$$x - 5 > 0$$

$$x > 5$$

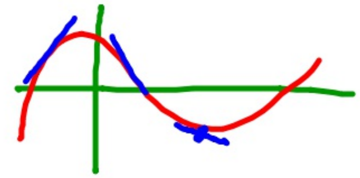
$$f(x) = \begin{cases} \frac{x-5}{x^2+3} & x > 5 \\ \frac{-(x-5)}{x^2+3} & x < 5 \end{cases}$$

$$\lim_{x \to 5^-} f(x) = \frac{-(5-5)}{x^2+3} = \frac{0}{28} = 0$$

$$\lim_{x \to 5^+} f(x) = \frac{x-5}{x^2+3} \quad \frac{0}{28} = 0$$

$$\boxed{\lim_{x \to 5} f(x) = 0}$$

Is calculus all about limits?



$$\frac{y_2 - y_1}{x_2 - x_1}$$

but it is the backbone of the two major topics in Calculus I:

- the slope of a curve
- the accumulation of infinite slices

Find the value of a so that $f(x)$ is continuous everywhere

http://bit.ly/detcont1

$$f(x) = \begin{cases} 2x+5 & x \le 1 \\ ax+2 & x > 1 \end{cases}$$

$$\lim_{x \to 1^-} f(x) = f(1) = \lim_{x \to 1^+} f(x)$$

$$7 \stackrel{?}{=} 7 = a(1) + 2$$

$$7 = a + \cancel{2}$$

$$-2 \qquad -\cancel{2}$$

$$5 = a$$

http://bit.ly/detcont3

Find the values of a and b such that f(x) is continuous

$$\cancel{g}f(x) = \begin{cases} -2x^2 + 3, & x < 0 \\ ax + b, & 0 \le x \le 1 \\ 9x & x > 1 \end{cases}$$

Cont @ 0?

$$\lim_{x \to 0^-} f = f(0) = \lim_{x \to 0^+} f(x)$$

$$3 = b = b$$

Cont @ x=1 ?

$$\lim_{x \to 1^-} f(x) = f(1) = \lim_{x \to 1^+} f(x)$$

$$a + b \overset{\checkmark}{=} a + b = 9$$

$$a + 3 = 9$$

$$a = 6$$

P. 80 # 61 – 66

99 – 106

Calcchat.com

Assess:

~~Monday~~.

Weds D. S.